Swiftlets build their nests crowded together on the face of steep and almost inaccessible cliffs, so that it is very difficult and dangerous to obtain them. M. Pollen observes that in the nests both eggs and young birds in all stages of development may be found. One of this bird's names is *Vòromaola*, "Frolicsome-bird" (or possibly "Mad-bird"), probably from its wild dashing flight as it darts after its insect prey.

[To be continued.]

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## XXII.—*Some Comparative Osteological Notes on the North-American Kites.* By R. W. Shufeldt, C.M.Z.S.

Very recently the writer has been engaged in making comparisons of the characters presented in the skeletons of nearly all the genera of the Accipitres found north of the northern boundary of Mexico. By the Accipitres I mean the Cathartidæ, the Falconidæ, and *Pandion*, but not the Striges. For the most of my material I am indebted to the Department of Comparative Osteology of the U.S. National Museum, though my own collections are not inextensive, affording as they do certain specimens not in the possession of the above-named institution.

The true Raptores, including *Pandion*, offer us many osteological characters of good classificatory value; but when we come to consider the skeletons of the Kites of North America many perplexing points confront us.

Of these latter birds I have carefully examined and compared the skeletons of *Elanoides forficatus*, *Elanus leucurus*, and *Ictinia mississippiensis*, but up to the present time no opportunity has been afforded me for studying the osteology of the Everglade Kite (*Rostrhamus sociabilis*). Not only have the skeletons of these species been intercompared, but comparisons have also been made with the skeletons of many raptorial birds of other countries, as well as with the osteological characters of *Circus* and *Accipiter* (several N.-American species), of many species of *Buteo* and *Falco*, of *Urubitinga anthracina* and *Asturina plagiata*, of American species of

*Archibuteo* and *Haliaëtus,* and finally with examples of two species of *Polyborus* and of *Pandion.*

In so far as their osteological characters are concerned, our Kites differ most markedly among themselves. As for instance, with respect to this part of its structure, *Ictinia mississippiensis* might almost at once be dismissed by saying that in all essential particulars its skeleton is buteonine in character—it is a miniature *Buteo,* such as, for example, *Buteo lineatus.* In it, however, the basipterygoid processes are hardly discernible, or most often quite absent, while it presents the rather remarkable character in that the short basal joint of the second toe permanently fuses with the joint next beyond it. This latter condition I have also found to exist in *Haliaetus leucocephalus*; it is never present in any typical *Buteo* or in any of the other Kites.

All these Kites generally have the osseous nasal septum entire, but the superior osseous mandible is not laterally toothed.

Passing to *Elanoides forficatus,* we find its skeleton entirely different from the corresponding parts in *Ictinia*; and we are struck with the unusual number of important skeletal characters it holds in common with no less a distantly related form than *Pandion.* *Elanoides* agrees very closely with *Pandion* in the pattern of its sternum; in its having a *complete* fibula (a very unusual character); in its having the supraorbital parts of the lacrymals much reduced and the accessory piece in either bone absent (?); in its having a similar hypotarsus to its tarso-metatarsus (a still more uncommon feature), and in other minor points.

It is to be noted here that, although the supraorbital process of the lacrymal is short in *Elanoides,* with a probable absence of the terminal accessory piece, such is not the case in either *Ictinia* or *Elanus,* where it is long and has the accessory piece well developed, especially so in *Elanus.* The descending portion of a lacrymal does not articulate with the outer border of the *pars plana* in *Elanoides,* while it does so in *Elanus.* All have the *vomer* present, varying somewhat in form.

*Elanoides* agrees with *Ictinia* in being *desmognathous* much after the fashion of other Raptores; as we pass next to consider *Elanus*, however, we find that it is absolutely *non-desmognathous*, as its maxillo-palatines neither unite across the middle line nor come in contact either with the vomer or with the nasal septum. Thus this Kite, in so important a particular, forms an exception to Huxley's definition for his Aetomorphæ. *Elanus* differs in its skeleton in many other respects from the corresponding parts of this portion of their structure in both *Ictinia* and *Elanoides*. In it the basipterygoid processes are present, and in it we are at once struck with the notably broad post-palatines, which are comparatively narrow in *Ictinia*. In this last-named Kite, too, the mandible is fairly strong and lacks a ramal vacuity upon either side, whereas the bone in *Elanus* is characterized by being most remarkably weak and slender in its structure.

In all of these birds the inferior clavicular union is seen to be more feeble than it is in any others of the Accipitres, and the *furcula* is further characterized by having the hypocleidium absent in *Elanus* and only rudimentary in *Ictinia*. In all, again, the scapular process of a coracoid does not reach the clavicle.

The *sternum*, varying to no small degree in its general pattern in all these Kites, always has its manubrium very small, and the carina may extend the entire length of the sternal body, as in *Ictinia* and *Elanoides*, or the reverse of this may be the case, as in *Elanus*.

The xipho-sternum may be profoundly notched as in *Ictinia*, or once-fenestrated upon either side of the keel (*Elanus*), or it may exhibit a shallow emargination upon either side only, as in *Elanoides*.

As in other representatives of this group of birds, the ribs and vertebræ are very liable to vary, and that even in the same species. Coming to the pelvis, we find in these Kites, as a fairly constant character, that the ilia are not in contact anteriorly over the sacral crista, nor in the post-acetabular region is the bone, as a whole, especially bent downwards and forwards, as we so commonly see it in *Buteo*. The postpubic element of the pelvis is always interrupted.

In the skeleton of the leg the fibula is long, or, as we have said above, it may be complete, as in *Elanoides*. Accipitres as a rule, however, usually have the fibula long, so that counts but for little in most cases. We have seen how the hypotarsus of the tarso-metatarsus in *Elanoides* has a subcubical form, in one piece, and once-perforated for tendons, the whole practically agreeing with *Pandion*; but now in *Ictinia* the hypotarsus is represented by two small processes, much as we find it in most ordinary Hawks.

Usually the anterior aspect of the tarso-metatarsus of Hawks, Kites, &c. is longitudinally grooved down the shaft, especially for its proximal half. Now upon the upper third of this surface is seen an elongated tubercle for the insertion of the distal end of the tendon of the tibialis anticus muscle.

It is interesting to note, and the character is a good one, that in all the Falconinæ this tubercle is situated upon the *inner* side of the aforesaid groove, it being on the *outer* side in the *Buteoninæ*; while among the Kites it is seen in the *middle* of the groove, or, if this latter is but faintly marked, at least in the *middle* of the shaft.

Remarkable differences are found in the digits of the pes in all of the Kites here examined, for although in all the first three joints of the fourth toe are subequally abbreviated, the distal one of the three may be quite rudimentary, as we find it in *Elanus*; again, the prebasal joint of the third toe is more or less shortened, and the basal joint of the second toe is always much abbreviated, while in *Ictinia*, as we have seen above, it permanently fuses with the joint next beyond it.

When we come to be thoroughly acquainted with the entire structure, in each case, of the three genera of Kites of which we have presented in brief the osteological characters above, there is no doubt that we shall find them amply supported by the remaining systems in their economies. Indeed, in so far as the systematists have pointed out the external characters of these birds, it would seem to go far towards demonstrating such a matter.

## *Concluding Remarks.*

Some very extraordinary classification has been adopted by American ornithologists for the four different kinds of Kites in the United-States avifauna. The official 'Check-List' of the American Ornithologists' Union groups them as so many genera along with the Buzzards, Hawks, Goshawks, and Eagles, without any special dividing line. Ridgway has also adopted this arrangement. Coues, in his 'Key,' makes a subfamily for them, Milvinæ, which is much better, though his definition for the same is very faulty. I have never had the opportunity of examining any of the genus *Milvus*, but the last-named author believes it stands near our *Elanoides*.

Further, it is the opinion of the present writer that we shall not be enabled to define, with any degree of accuracy, the position in the system of any of these birds until we are in possession of a far more exact knowledge of the morphology of the entire group to which they belong. Provisionally they ought at least to constitute a Family, thus :—

| Family. | Subfamilies. |
|---|---|
| MILVIDÆ. . . . . | Ictiniinæ.<br>Elanoidinæ.<br>Elaninæ.<br>Rostrhaminæ (?), not examined. |

It means something that *Elanoides* should have so many osteological characters in common with *Pandion*, and such important ones. Not that *Pandion* and *Elanoides forficatus* belong together, but simply that it points to something the hidden meaning of which is not as yet in our possession. It means something else that nearly all the osteological characters of *Ictinia* are so strictly *Buteonine* and so utterly different from the corresponding ones of *Elanoides*. Finally, it surely means something more that the non-desmognathous *Elanus leucurus* presents an entirely different set of osteological characters from both the first two mentioned Kites, and that a set which, in our present state of knowledge of the subject, leaves us very much in doubt as to its true affinities.

We stand in need of a little more light along the lines indicated, and such a task will well repay the ornithotomist.